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Gas Journal

LIGHT - HEAT - POWER - BY-PRODUCTS

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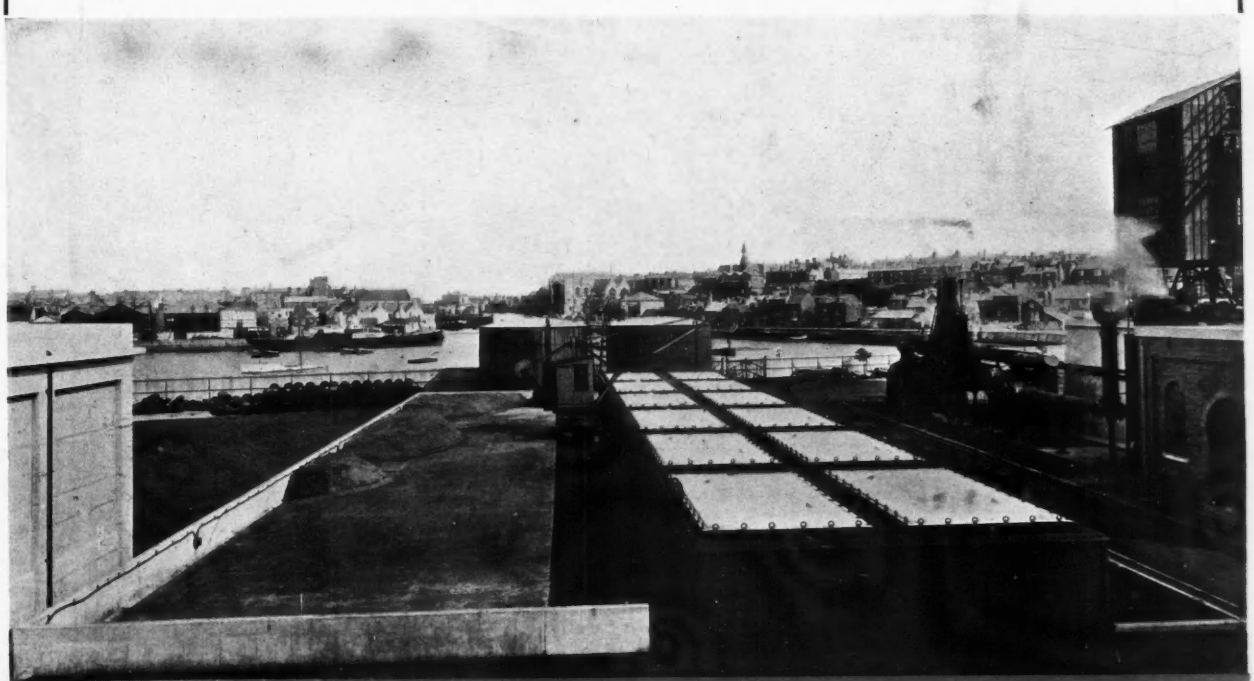

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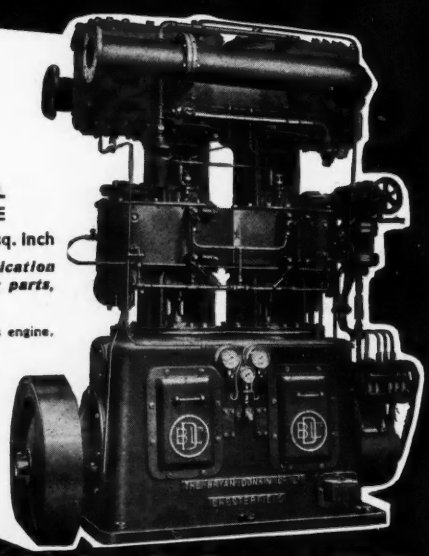

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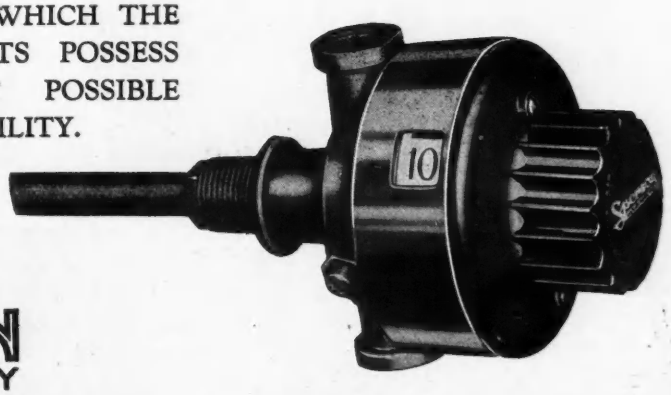

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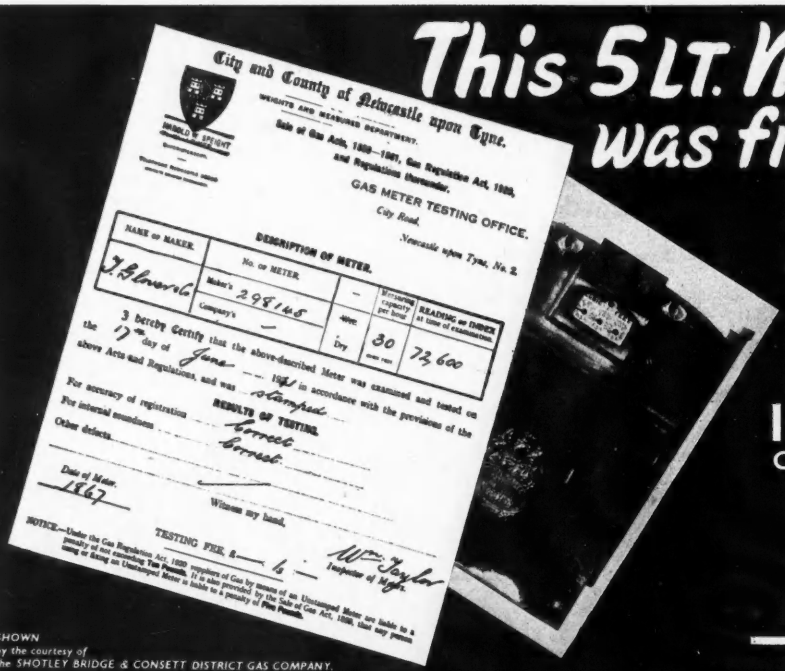
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For accuracy of registration Correct
For internal soundness Correct
Other defects
Dated 1867
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TESTING FEE, 6 — 6 —
Inspector of Meters.

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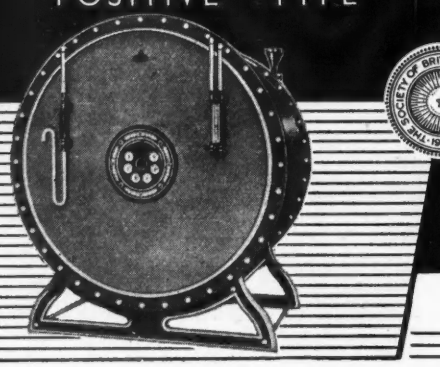

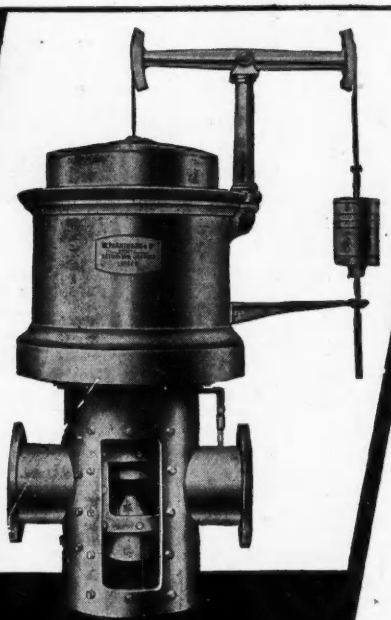

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GAS JOURNAL, DEC. 17, 1941

VOL. 236 93rd YEAR No. 4100

EDITORIAL NOTES

DOMESTIC WATER HEATING

WE are glad to publish to-day a "reply" by Mr. F. Brooks to Mr. Leopold Friedman's arguments and contentions regarding the development of the domestic water-heating load set out in the treatise we gave in the "JOURNAL" of Dec. 3. Mr. Friedman is, of course, a champion of the instantaneous water heater. Mr. Brooks has a lifelong experience in the circulator and storage water field. Both protagonists have been in the lists before; each shares our view that the potentialities of gas for water heating in the post-war era are great. The point at issue is how best, in the consumer's interest, these potentialities can be realized; in this respect two cardinal factors emerge. One is that the domestic water-heating load by gas must not be planned piecemeal, but must be visualized as a whole; the other is—as far as we can see it—that relative values will have to be placed on which type of gas water-heating appliance is the one most fitted to deal with specific requirements, bearing in mind the service rendered and the public's capacity to pay for this service. No policy adopted by the Industry should favour the development of a particular type of appliance—that is, the development of one type at the expense of another—unless it is satisfied beyond all doubt that it is in fact the right appliance for a specified purpose.

Our feeling is that the Industry is vague concerning the development of the water-heating load, and that the policies of individual undertakings have been formulated on a parochial basis, without adequate appreciation of what we may term "market research" and the actual needs of consumers. The attitude, we think, has been to regard development of the load strictly in relation to existing gas-making plant and distribution capacity, and numerous bogies have been allowed to raise their heads. Current difficulties—often more seeming than real—have retarded load expansion. Simple remedies to troubles on the district have been neglected. Pilot lights have been blamed for stoppages caused by what has been neither more nor less than unsuitable gas; maintenance costs of apparatus have been allowed to accumulate because we would not—not because we could not—economically supply gas practically free from sulphur. We have regarded mains capacity in the light of an annual increase in total gas consumption of the order of 5% or less. We have looked at development piecemeal, not wholesale, forgetting that bidding for a new load demands entirely different conceptions and tactics from those employed compromisingly in existing competitive circumstances. We make no excuse for putting forward these generalizations; we believe them to be fundamental to the broad issue of load expansion.

From generalizations let us turn to the particular, which we think in this instance is preferably stated as Brooks plus Friedman rather than circulator *versus* instantaneous heater. In our issue of Dec. 3 we summed-up certain of Mr. Friedman's arguments; to-day we will epitomize certain of the contentions advanced by Mr. Brooks—and we have no intention of sitting in judgment. What we should like is that executives in the Industry should, irrespective of war conditions, sit up and take notice of this discussion of our two contributors on water heating, and—after casting aside preconceived notions—view this important matter anew.

Thinking in terms of quality of service, Mr. Brooks maintains that the Gas Industry should consider whether it is wise to advocate appliances which might effect economy only by failing to fulfil the consumer's full requirements. This line of argument must depend for its validity on the interpretation of "full requirements." Granted two premises, our full requirements, as we imagine them to be, would be met (*a*) if there was no war; (*b*) if we had abundant money or barter to offer in exchange for these "full requirements." Our task is to satisfy not "full" requirements, but those which we consider to be needful in a set of circumstances. It is for us, as for many others, a question of pocket *versus* service, with the inevitable corollary of stemmed desire. Let us take the provision of hot water for bathing purposes. We should like a very large bath with a large supply of hot water available at all times free of cost; we think that many others would share our desire but would, in common with ourselves, be unable to attain it. In effect, Mr. Brooks argues that one can be assured of a hot bath, conveniently and speedily, if one has a hot water circulator with storage, but that a bath supplied with water from an instantaneous gas heater is insufficiently hot and is the reverse of "instantaneous." With his views on the rating of instantaneous water heaters on gallonage raised 40°F. we are in agreement, and we realize that the ordinary cast-iron bath has a large heat-absorbing capacity, and that it takes some time to prepare a bath with an "instantaneous" heater. Mr. Friedman, it must be noted, allowed for an *average* water temperature at outlet of heater of 110°F., a temperature rise of 65°F. from cold. We think that, at a certain loss in thermal efficiency, we could adjust the flow from an instantaneous heater to give us a hot bath—from cold, it must be remembered—in any weather, and that this course would not seriously influence the total annual account for gas used for the provision of hot water for bathing purposes. We have found, for example, that one can easily cut one's gas bills by having not less frequent baths, but less hot water in them. And while agreeing in theory with experts' tables of heat requirements, we have found that it is not a difficult task to upset in practice theoretical test-bench figures or figures based on working results in particular households.

In saying this we cast no bias on circulator or instantaneous gas water heater. Each can be faultily installed; of this more later. Each can be faultily used. Each is important to the user, and each is important to the Gas Industry. To our mind, however, there may well be a line of demarcation between the two, depending on income levels and relevant circumstances. That line has not yet been defined, but some clearer definition is needed; and the problem divides itself into two distinct parts—the present and the future. The observations of Mr. Friedman and Mr. Brooks should help to clarify thought on this.

For an "instantaneous" bath—were there no economic considerations—we should not choose an "instantaneous" gas water heater. We should have ample gas "boiler" capacity, ample storage capacity, and full-bore pipes and fittings, by which means we should be assured of rapid bathing facilities of a high standard. If economic considerations were paramount we should have either a cold bath or none at all, according to inclination. Between these two extremes there is a considerable, ill-defined gulf which in the past has been far too much clouded with theory and partisanship. "Luxury" and "necessity" are relative terms; as far as water heating is concerned, their relationship calls for clearer thinking, and we feel that to class specific types of gas water heater into "luxury" and "necessity" groups needs a courage which must not be the result of hasty thought.

So far, our observations have been chiefly concerned with the provision of hot water for bathing purposes, which, of course, is only one phase, though an important one, of the domestic water-heating load. We shall return later to further consideration of the general load and to Mr. Brooks' arguments. In the meantime, and while these arguments will be receiving from others the study they obviously merit, we would say a word on the subject of maintenance as affecting the water-heating load. Both Authors comment on the importance of this aspect. Now in arriving at the all-in weekly cost of water heating employing

instantaneous gas appliances Mr. Friedman took over a period of ten years an annual maintenance cost of 10%, and in this regard he contended that, in general, by co-operation between the Gas Industry and the manufacturers in improvement of design and standardization of district conditions, it should be possible to reduce maintenance charges considerably. This contention is in accord with views we have expressed from time to time in these columns. We have said that more attention should be paid to installation work, which has a major bearing on maintenance costs, and that maintenance should be far less haphazard and less unskilled than it has been in the past. We realize that under present conditions severe limitations are imposed on the achievement of the desirable, but we must look ahead towards a higher standard of installation work and a better grasp of the problem of maintenance of appliances. Attainment of these is necessary to the development of the domestic gas load in the post-war era.

On more than one occasion in the years immediately preceding the war we have emphasized that the finest gas water heater can be ruined by faulty installation work. However well an appliance may have been designed and manufactured, and whatever care is taken to ensure that it is as far as possible foolproof and has a performance sufficiently flexible to suit varying conditions, it can never be fully satisfactory unless its installation is correct. And before the war we did plan sufficiently for regular maintenance—we are thinking of the country as a whole; certain individual undertakings proved exceptions to this broad generalization. Hot water on tap by gas does imply a measure of maintenance, but, carefully planned, this need not be unduly costly. The water-heating load demands a special technique and special training, but this technique is not difficult to acquire, and prior to the war appliance manufacturers were prepared to assist in the necessary training. Writing a few months before the outbreak of war we suggested that the essence of maintenance schemes was knowledgeable and regular inspection. If this was adhered to, we said, it would be found that complaints between visits would be very rare, and that the best way of dealing with such special complaints was to regard them as being outside the regular maintenance scheme. We pointed to one difference between gas appliances and electrical appliances, mentioning that troubles with the latter make themselves felt at once. The breaking of an element, for example, puts the appliance out of action. With gas appliances, on the other hand, trouble may build itself up gradually and without its being apparent to the consumer. As instance, the corrosion caused by the products of combustion gradually building up deposits which adversely affect performance. And considering maintenance costs we pointed out that the Gas Industry could do much to reduce them by supplying gas of high and constant quality and as free as possible from sulphur. Taking maintenance costs of domestic appliances as a whole, Dr. Hartley suggested at the Institution meeting last June that, if sulphur were eliminated, it would not be unreasonable to anticipate a saving in the cost of maintaining appliances and of dealing with complaints of 0.1d. per therm sold to domestic consumers.

Apart from cost considerations, however, this question of maintenance of new and improved appliances does point to the need for the Gas Industry to keep in the closest touch with developments and to be prepared to plan for and work for new loads under new conditions—to regard the problem of load building as a whole and to adopt fresh and modify existing methods accordingly. Due to careless installation and failure to recognize that automatic service calls for new—not necessarily difficult—technique, there have been instances of unsatisfactory service on the district which could easily have been 100% efficient if the factors involved in affording this service had been properly appreciated and plans laid to ensure it.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

Building or Constructional Operations

A correspondent suggests that the information contained in our Editorial of Nov. 26 with reference to the necessity of obtaining permission from the Board of Trade for building and constructional operations on gas-works may be somewhat misleading and that it should be amplified. We stated that Regulation 56A Defence of the Realm Regulation S.R. and O. 1940, No. 1678, as amended by S.R. and O. 1941, No. 437, refers to all buildings and constructional operations carried out on a gas-works, including "work connected with fixed plant such as the resetting of retorts."

Our correspondent explains that he has been in communication with the Board of Trade concerning work which his Undertaking is carrying out. The Board of Trade decision on the point is that "Retort re-setting can be carried out without a B.o.T. permit providing no serious alterations are made in the design whereby the capital value of the plant is increased." And further that "official sanction to purchase iron and steel in connexion with a contract is sufficient to cover the whole cost of building or constructional operations as amended by S.R. & O. 1941, No. 437. There is no necessity to obtain any further approval of the work concerned."

We would state that it was only with great trepidation that we embarked on our exposition of this intricate subject. Since one case of practical experience is worth any amount of theory, we are very grateful to our correspondent for letting us know of an actual ruling he has obtained.

Personal

The President of the Board of Trade has appointed Mr. A. E. SYLVESTER, General Manager of the Gas Light & Coke Company, to be Deputy Regional Fuel and Power Controller for the London region.

* * *

Mr. ADAM C. FINNIE, who for some years has been Gas Manager at Duns, has obtained a similar appointment with the Melrose Gas Company, and takes over his new duties on an early date.

* * *

Mr. H. HOCKINGS, Assistant Industrial Gas Engineer with the St. Helens Corporation, has been appointed Technical Assistant in the Industrial Gas Section of the Middlesbrough Corporation Gas Undertaking.

Obituary

James Bridge

The death took place on Dec. 11 of Mr. JAMES BRIDGE, Engineer, Manager and Secretary of the Elland-cum-Greetland Gas Company. Mr. Bridge served five years' apprenticeship under the Engineer and Manager of the Gas and Water Departments of the Borough of Leigh, Lancashire. His first appointment was as Junior Assistant with the Stretford and District Gas Board. For five years he held the position of Assistant Engineer and Manager to that Board. His next appointment was with the Bolton Gas Department as Chief Assistant to the Engineer and Manager. In 1921 he became the Engineer and General Manager of the Elland-cum-Greetland Gas Company, which position he held till his death.

From 1913 to 1919 he was the Hon. Secretary of the Manchester and District Junior Association, being elected President in 1920. From 1929 to 1937 he held the position of Hon. Secretary and Treasurer of the Manchester District Association of Gas Engineers, during which period he took an active part in the formation of the scheme for the education and certification of those engaged in the technical work of the Gas Industry. For many years he was one of the two representatives of the British Junior Gas Associations on the London Executive Committee. He was the first Chairman of the Yorkshire District Gas Education Committee from 1927 to 1936. In recognition of this important educational work on behalf of the Junior Associations he was elected an Honorary Member of the Yorkshire Junior Gas Association. He was a member of the Yorkshire District Tar Board and of other committees connected with the Gas Industry. He was also a Director of the Kippax and District Gas Company, the Sherburn and South Milford Gas Company, and the Thurso and North of Scotland Gas Corporation.

Institution of Gas Engineers

The Council of The Institution of Gas Engineers met in London on Tuesday, Dec. 9. The following were some of the matters dealt with:

79th Annual General Meeting.—It was decided to hold, if circumstances permit, the 79th Annual General Meeting in London early in June, 1942. The meeting will occupy a single day, and a series of short Papers dealing with questions of current interest to the Gas Industry will be presented and discussed.

Affiliated District Gas Associations.—The Council discussed at some length the best means of securing closer liaison between the Affiliated District Gas Associations and the parent Institution. It was decided that after each meeting of the Council a note should be

prepared of the principal matters discussed and that this should be sent to the District Members of Council for report to their Associations not less than twice a year, preferably at their Half-Yearly and General Meetings. It was suggested that discussion of these reports should be specifically provided for in the Agenda of such meetings. It was also decided that specific provision should be made in the Agenda of every Council Meeting for the discussion of any matters that the District Members of Council desire to raise arising out of the notes sent to them from time to time.

Education.—It was reported that the Gas Education Committee had considered the standard of general education required for entry to the examinations of the Institution. The Council approved the Committee's recommendation that, while it was undesirable to make any alterations in the regulations during the war, the attention of gas engineers should be drawn to the need when selecting pupils and/or apprentices of paying due regard to the standard of their general education.

Committees of Enquiry.—Continued progress was reported of the four Committees of Enquiry appointed by the Council to consider some of the questions arising from the Institution Symposium of June, 1941. The Committees are meeting regularly and have already taken oral evidence from many persons in the Gas Industry.

Mines Department, Fuel Efficiency Committee.—It was reported that joint meetings have been organized by the principal engineering institutions in eight industrial centres at which members of the Fuel Efficiency Committee will open a discussion of ways and means of effecting the maximum economy and efficiency in the use of fuel. The District Gas Associations are collaborating in these meetings.

Medals.—It was decided not to award the Institution Gold Medal and the H. E. Jones London Medal for 1941. Papers will be considered as usual from the Affiliated District Gas Associations for the Institution Silver Medal for 1941 and from the Junior Gas Associations for the Institution Bronze Medal, 1941.

Membership.—The report of the scrutineers at the ballot held in November, 1941, was announced and indicated that four Members, 18 Associate Members, and two Associates had been elected. The list of names of these members of the Institution follows. Eight applications for Membership of the Institution were approved for submission for ballot by corporate members, and five applications for Studentship were accepted.

Membership

Hatswell, Frederick Thomas, Engineer and Manager, Wombwell Urban District Council Gas Department.

Hepworth, Jack, Distribution Superintendent, Stretford and District Gas Board.

Melville, Stirling Goodall, B.Sc., Chief Technical Assistant, Edinburgh Corporation Gas Department.

Mordecai, William Emlyn, B.Sc., Manager and Engineer, Coking Department, Bearpark Coal and Coke Company, Ltd., Co. Durham.

Associate Membership

Beavis, David, Assistant Engineer and Manager, Helensburgh Corporation Gas Department.

Brown, Lafayette Morcom, B.Civil Eng.(Melbourne), Assistant Engineer, the Power Gas Corporation, Ltd., Stockton-on-Tees.

Cooper, Herbert George, Technical Assistant, Manchester Corporation Gas Department.

Crump, Stanley Charles, Chief Technical Assistant, Exmouth Gas Company.

Cullingworth, John Edwin, B.Sc., Chemical Engineer, W. C. Holmes & Co., Ltd., Huddersfield.

Cutler, William Joseph, Technical Assistant and Works Chemist, Gravesend and Milton Gas Light Company.

Davis, Kenneth, Chief Meter and Fittings Superintendent, City of Stoke-on-Trent Gas Department.

Foot, John Anthony Ashley, Assistant Distribution Superintendent, Gas Light and Coke Company.

Gray, Leslie, Technical Assistant, Blackpool Gas Department.

Hamshaw, Marcus, B.Sc., Technical Assistant, Liverpool Gas Company.

Harris, Robert William Henry, B.Sc., Assistant Engineer, Ilfracombe Gas Company.

How, Cecil Albert, Industrial Representative, Gas Light and Coke Company.

Keywood, Harold Charles, Technical Assistant, Blackburn Corporation Gas Department.

Livett, Arthur Ernest, Industrial Representative, Gas Light and Coke Company.

March, John Douglas, Technical Assistant, Hampton Court Gas Company.

Mottram, William, Deputy Engineer and Manager, Morecambe and Heysham Corporation Gas Department.

Thompson, Herbert George Gordon, M.A., Gas Equipment Engineer, Gas Light and Coke Company.

Wilkinson, Ronald, Shift Superintendent, Dudley, Brierley Hill, and District Gas Company.

Associateship

Haslam, George Stanley, B.Sc. Tech., Ph. D., Chief Chemist, Amalgamated Denaby Collieries, Ltd., Doncaster.

Yates, James Ivan, Managing Director, John Wright & Co., Ltd., Birmingham.

National Gas Council

A meeting of the Central Executive Board of the National Gas Council was held at Gas Industry House, 1, Grosvenor Place, London, S.W. 1, on Tuesday, Dec. 9. Sir David Milne-Watson, Bart., LL.D., D.L., presided.

Before proceeding with the business of the meeting the Chairman introduced Mr. A. E. Sylvester, who had been appointed to take the place of Mr. R. W. Foot, as representative of the London District Executive Board.

It was reported that Mr. J. D. Smith, who had been a member of the Board for 22 years, had resigned the position of Engineer and General Manager of the Belfast Gas Department, and that this would entail his resignation from the Central Executive Board also. It was agreed that a letter should be sent to Mr. Smith conveying the best wishes of the members of the Board upon his retirement.

A report on the general coal position was received and considered.

In regard to Gas Charges, General Licence dated Aug. 15, 1941, it was reported that the President of the Board of Trade was receiving a deputation from the National Gas Council the following day.

Reports from the Tar Advisory Committee were submitted and the steps taken to prepare a case regarding the price of tar were approved.

In connexion with the use of gas in industrial establishments it was reported that undertakings who were not already subscribers to their local Industrial Gas Development Centre had been urged by the Council to join their centre.

The following representatives were re-elected to serve on the Council of the Conjoint Conference of Public Utility Associations: Mr. J. H. Cadman, Mr. R. Halkett, Mr. J. Jamieson, Mr. A. W. Smith, Col. H. C. Smith.

Mr. A. E. Sylvester was appointed to take the place of Mr. R. W. Foot.

War Damage Insurance: Deputation to the Treasury on Dec. 2.—It was stated that a report had been circulated to the members of the Board, from which it would be seen that the Conjoint Conference had already had an interview with the Treasury in order to deal with certain points which affected gas, electricity, and water in common. A further deputation to the Treasury was to take place on Dec. 16, for the purpose of considering the matter as it related to the Gas Industry.

It was reported that at the meeting of the Post-War Planning Committee, held in October, Mr. E. V. Evans had been unanimously appointed Vice-Chairman of the Committee. A meeting of the Committee had taken place the previous day, when the Terms of Reference approved at the last meeting of the Central Executive Board had been submitted. It was added that a meeting of the Council of the British Gas Federation was being held at the conclusion of the meeting of the Board, with a view to carrying out the decision that the Post-War Planning Committee should function under the British Gas Federation.

National Gas and Electricity Committee.—A meeting was held on Nov. 14 (*a*) To appoint a representative in the place of Mr. R. W. Foot. At that meeting Mr. Foot's appointment to the B.B.C. had been reported and his resignation as Chairman of the Committee accepted. Mr. John Mould, representing the Incorporated Municipal Electrical Association, had been unanimously elected Chairman and Mr. E. V. Evans Vice-Chairman of the Committee. The Central Executive Board agreed that Mr. A. E. Sylvester should be appointed to take the place of Mr. R. W. Foot as their representative on the Committee; (*b*) To appoint a Joint Secretary to the National Gas and Electricity Committee in place of Mr. E. J. Fottrell. Mr. L. F. Stemp, Legal Adviser to the Council, was appointed by the Board to take the place of Mr. Fottrell (seconded to the Board of Trade), as one of the Joint Secretaries of the Committee.

The next meeting was fixed for Tuesday, Jan. 13, 1942, at 1.30 p.m.

Preserves Exhibition at Cambridge

Great local interest was aroused in a recent exhibition of preserves at the Cambridge University and Town Gas Light Company's showrooms. This venture was the first of its kind to be held in the Borough, and, the Company believes, was probably the first such exhibition in the whole country.

The Chairman, Mr. J. F. Cameron, supported by Mr. J. Hunter Rioch, General Manager and Secretary, presided at the opening ceremony. The Mayor, Sir Montagu Butler, in opening the exhibition, said the great need of the moment was the production of food and its conservation, and anything which could be done to obtain more plentiful supplies in the country, and keep them longer, would save shipping. The work which the Gas Company was doing, he said, as a labour of love was a worthy contribution to this object.

Visitors to the exhibition found a wealth of interest and practical education on the subject of preservation. Daily demonstrations were given by experts on many aspects of the subject, and an advice bureau, staffed by representatives of co-operating bodies, including the Food Ministry and the County Agricultural Department, was set up. Competitions were held, divided into six sections devoted to jams, bottled fruits, pickles, chutneys, storage sauces, and dried products. Nearly five hundred exhibits were included, and prizes were offered for the best entries in not less than four sections by any organization, such as Women's Institutes, the best individual entry in either town or county, and also in the Gas Company's area of supply in the county, with special awards for schools.

DOMESTIC WATER HEATING

By F. BROOKS

I once had the pleasure of meeting Mr. Leopold Friedman in open discussion on the question of multipoint versus circulator gas water heaters at a Gas Salesman's Circle meeting. Mr. Friedman remembered this; and when he prepared his new analytical treatise, which you published on Dec. 3, he sent me a copy asking for my comments. I thank him sincerely for the implied compliment in the mutual respect we hold for each other's opinion.

Unfortunately, owing to the exigency of wartime business, I was unable to complete my comments before the treatise was published, and I would therefore like to reply through your columns.

Nothing but praise can be accorded Mr. Friedman's eagerness to ensure the Industry's preparedness for post-war business, and he has gone to great length to demonstrate the extent of the possibilities. This part of the article is well summed up in your editorial notes, the conclusion of which tempts me to the following comment.

MR. FRIEDMAN includes a wealth of tabulated data, but some of them are quite out of date for practical purposes—such as A. H. Barker's estimation of percentages from fuel used in the kitchen as published by the Fuel Research Board in 1922, since when kitchen equipment has passed through revolutionary changes—such as the possible needs of various income groups in Table III.

Other tables represent opinions with which not all will be in agreement.

Table III indicates the possible need for sink and bath heaters as three times that of multipoint heaters, and although such a proportion may even apply to those in use owing to the bath heater holding the field before multipoint heaters were available, the bath heater has since receded in popularity, and many will think the possible future installations should be in the reverse ratio. It is indeed surprising to note from this Table that multipoints are considered suitable for only 12% of the families, and none under a pre-war income of £200 per annum.

Later it is remarked that "luxury demands and ample funds suggest the use of storage water-heating methods"; but there is plenty of evidence that storage water heaters can supply and are supplying economically the needs of a large proportion of those under the £200 per annum income group. As this group represents over 50% of the population, the Industry cannot afford to overlook this fact.

Mr. Friedman's observations are all in favour of heating water quickly to very moderate temperatures, and under the heading of "Hot Water Requirements" the Author states that "for washing, cleaning, cooking, and laundry operations of the greatest diversity, the average temperature will be of the order of 110°F." In view of this it is difficult to understand his strong inclination towards electrical heating, which is at the extreme opposite end of the scale, generally providing very high temperature water in storage heated through a slow process, as shown in Table VIII, of which more later.

While on this subject, may I ask why so many instantaneous heaters are rated in gallons per minute giving a temperature rise of only 40°F., which is useless for general purposes. This is misleading to the public, who have little knowledge of degrees, and are led to expect really hot water of the volume specified. Such figures also have little value in calculating B.Th.U. output, as the efficiency drops considerably with reduced volumes at higher temperatures. It is my intention, however, not to discuss the many parts of the article which are confined to instantaneous heaters, but to state the case for the storage heater and refute any erroneous impression that might arise from Mr. Friedman's conclusions.

Let us look at the question first from the gas undertaking's point of view, then from the consumer's, and finally in reference to post-war housing problems.

Any considerable addition to the water-heating load must of necessity react on the size of the undertaking's mains and other equipment, which means the building-up of its capital, cost of which revenue has to bear. The capacity of holders has the advantage of levelling-out the works output, but mains are another matter, and in appreciation of this the gas refrigerator has been given pride of place as a revenue earner by its small load spread over twenty-four hours of the day.

Any equipment that tends to spread the load must therefore be given prior consideration when post-war tariffs are under review (tariffs generally being considered as proportional payment for upkeep of mains, plant, &c.). Indeed, some undertakings recognized this in pre-war days by supplying gas at a lower rate for circulators than for instantaneous heaters.

The life of the heater, together with maintenance cost, is also a vital consideration, particularly where simple hire of equipment is involved. It is interesting to note that Mr. Friedman, in Table V, estimates the charge for maintenance at 10s. per annum for both the circulator and the normal multipoint. To what, then, can we allocate the difference in most undertakings' charges for simple hire of the two fittings in addition to inital outlay? The answer is, depreciation.

The consumer is not concerned with technical details; his first consideration is what he gets in return for money paid. So often have I stressed that it is bad salesmanship to sell plant which will effect economy in gas consumption only by failing to fulfil the consumer's full requirements. There are, of course, economic limits to what one may spend on things, but "things" from the economist's point of view must come under one of two headings—*viz.*, necessities or luxuries. Even those in the lower income categories generally have something more than necessities.

In Table V, from a total expenditure of £4 5s. weekly, 1s. 5½d. is allocated to gas, whereas 15s. 7½d. is shown on "other items." The latter may be considered as the "luxuries section," assuming all essentials are covered; and no economist can segregate this item, as it is entirely personal. From this "A" may take a big share in cigarettes, "B" sports or travel, while "C," being of the house-proud type, may prefer a heated linen cupboard or a heated towel rail in his bathroom to either of these other luxuries. Who shall say he is wrong, particularly as his expenditure is the more likely to remain within the income limit, and who can call this "easy selling to the wealthy?" No, the "other items" represent a big figure from which gas undertakings, by the appropriation of a very small proportion, can supply many things that particular consumers may desire. This should not lead to the conclusion that the circulator is necessarily more costly than the instantaneous heater; it is mentioned to demonstrate the wider application that is available.

Advantages of the Circulator

The advantages of the circulator when used for simple hot water supply are not at all obscure, and some of the figures in the tabulations may be misleading.

Rate of delivery and the difference between tap temperature and temperature of water used are matters that affect final figures of efficiencies.

The present-day cast-iron bath is a veritable absorber of heat, and it is generally necessary to obtain an average tap temperature 5° to 6°F. above the requisite bath temperature; and if the period of draw-off is extended by slow delivery, this difference of tap and bath temperature is increased very considerably.

With a heated storage, rate of delivery is limited only by the size of pipe and head of water, and the tap temperature does not vary by rate of flow at any tap or should more than one tap be used at the same time.

With a multipoint or bath heater the rate of flow is controlled by the maximum heat input from the gas, and the period of delivery is usually more than twice that required for water from a storage system.

Notwithstanding these points of advantage with a storage system, too much attention is often given to drawing bath water, while the efficiency for other water used throughout the day is neglected, although it is usually greater in volume. Here, again, the storage system with its slow circulating heater has a great advantage. Try, for instance, to draw a small volume—say, one pint—of really hot water from a multipoint heater, and calculate the efficiency from the period over which the full gas is being consumed. The gas used is, of course, out of all proportion to the heat input into one pint, and such an instance should not be considered without reference to times when larger quantities are drawn. On the other hand, it serves to show one advantage of the circulator, the full gas rate to which under similar conditions would not open up, if the gas were shut down thermostatically, until a number of such draw-offs had taken place.

It is truly said by Mr. Friedman that "the efficiency of use increases when the installation is operated to capacity," but in making this statement does he realize that the maximum output capacity of the multipoint is generally about three times that of the circulator for a similar household?

This raises the most debatable point of the whole discussion, and one on which I disagree with Mr. Friedman, It is difficult to get a real comparison of efficiencies, as the use and duty of the two types of heater vary so much; but in Table VII, in his anxiety to show electrical heating as more favourable than a gas circulator, Mr. Friedman provides a link. In this Table two kinds of electrical heaters are quoted, the 20-gallon electric storage with an efficiency of use of 80%, and immersion heaters with an efficiency of 65%. Since the efficiency of input of both heaters might for this purpose be considered as similar to 100% the difference in the overall efficiency can only be regarded as the difference in the heat loss from the storage, all other losses being similar.

This stresses the importance of lagging, which should reduce heat losses to a minimum in all gas-heated systems; but in application to a tank after it is fixed it is not usually equal to the thermal installation of the 20-gallon electrical storage apparatus. It might therefore be considered that the immersion heater quoted is applied to a tank lagged in the less efficient but similar manner usually adopted with a gas circulator, if the lagging is done *in situ*. From this it is a simple calculation, assuming a boiler efficiency of 75%, which can easily be proved for most standard types, to find the efficiency of the circulator system 75% of 65%, which equals 48.75% and not the low figure of 30% quoted in this Table.

Continuing the calculation on this basis the other figures would be: Therms burned 291; cost per annum £9 4s.; cost per week 3s. 8¾d., or 5¾d. more than the normal multipoint.

Further reference to Table VI shows the other charges, including equal maintenance costs, to be 1s. 7½d. for multipoint and 8d. for circulators, a difference of 11½d., showing with the correction of efficiencies a cost of 6½d. per week less for circulators than multipoints.

The figure of 48.75% is a reasonable average basis and puts the circulator well in front of either electrical heater even at ½d. per unit, with no proportion of the standing charge which generally goes with this rate.

Circulator *v.* Immersion Heater

This of necessity focuses attention on Table VIII, which, without any reference to instantaneous heaters, attempts to show that the gas-fired circulator is more expensive than an electrical immersion heater.

How the Gas Salesman must have gasped at the final figures. The electrical salesman will rejoice as he quotes them to his advantage without reference to other data.

We can, of course, take the figures quoted as being perfectly correct, and look for the reason why they conflict so much with general experience. The paragraph that follows the Table gives some clue, and it may have been better to have called in the local plumber in preference to the expert tester. In spite of the fact that tests should not be made on a system so appallingly designed that water could not be drawn at the sink, it appears that something else happened between the two tests. If the very low boiler efficiency of 60% is considered, the input by gas would be 42,000 B.Th.U. with an output of 20,328, while the electric immersion heater with input of 50,839 B.Th.U. (assuming 100% efficiency) gave an output of 31,572 B.Th.U. In the case of gas, therefore, with a water temperature of 133°F. the heat loss was 21,672 B.Th.U., while in the case of the immersion heater, with a temperature of 163.5°F., the heat loss was only 19,267 B.Th.U.

Was the tank lagged? If so, this should have been done before the gas test was taken or should have been mentioned in the comparison, as I know of no other way of explaining the reduced heat loss.

The inability to supply the sink except for a short period after drawing the bath is also difficult to explain, as even with the small recovery rate of the electrical heater the input was only one-third of the possible maximum, and the recovery rate of the gas heater was twice that of the immersion heater.

The conclusion drawn from these tests—*viz.*, that the storage heater cannot satisfy the normal needs of the small household unless the storage is greater than 20 to 25 gallons—is entirely misleading, as also is the whole of this tabulation. One can only assume that a specialized type of circulator (not generally available), burning only 30 cu.ft. per hour has been incorrectly connected to a system that was not reconstructed to make it suitable. Possibly intercirculation with a solid fuel boiler made the matter worse, and the selection of such a system for test is not only valueless, but harmful to the Gas Industry.

An Important Feature of Post-War Planning

In Table XI the back boiler is quoted with other heaters, but no mention is made of a supplementary heater combining one of the other heaters for summer use or for boosting when the fire has been insufficient. This is one of the important features of post-war consideration by the Gas Industry, as coal fires will be discouraged owing to pollution of the atmosphere, making way for fuller use of coke grates. Few will maintain such fires for space heating only, and the back boiler will become even more popular.

Hot water storage will then be provided, and the gas-fired circulator will have a strong advantage over the instantaneous heater, as it can be used at any time in conjunction with the back boiler if the storage is partially heated, when there will be no need to heat the water from cold as with the instantaneous type.

Lagging is, however, of paramount importance in all storage systems, and more attention must be given to this in the future, notwithstanding that heat losses, stressed so much, maintain their full value during many months of the year in helping to warm the house.

All post-war considerations tend to show that the personnel who were in the lower wage categories will demand more of the desirable facilities in the home than they had in the past, to dispel drudgery and maintain a high health standard. This will entail adequate hot water supply and comfortable temperature conditions, towards the provision of which gas can do so much.

Exhibition in Edinburgh

The important part which the Gas Industry is playing in the national emergency is being demonstrated at an exhibition in Edinburgh, which opened on Dec. 10.

An interesting display of equipment suitable for industrial canteens, A.R.P. centres, and British Restaurants has been arranged by the Edinburgh Corporation Gas Department. On Dec. 11 the latest Gas Industry film, "Eating at Work," was shown to a representative audience with a view to stimulating interest in the Government's latest call for canteen installations in workshops and factories.

Our Own Essential Industry

Appreciation of the work which British technical journals do for industry was voiced by Mr. John Pascoe, Deputy Chairman of British Timken, Ltd., at a lunch in London a few days ago to celebrate the 21st anniversary of the incorporation as a limited liability company of the business which has been manufacturing the Timken bearing for over 30 years. "Our progress," he said, "has been due in large measure to the fact that Britain possesses a great technical Press. . . . I would like to say how impressed I am by the way the technical Press is doing its important wartime job amid difficult conditions of paper supply and man-power. It is doing very real and vital services to industry. Its work is an essential part of the drive for higher production. It is an essential industry in itself. All executives know how valuable it is to get together with fellow technicians. Even in peacetime it is only possible for the larger industries to organize really representative conventions of men from all parts of the country. Yet technical journals stage a conference of the industries they serve once a week, bi-monthly, or monthly. They give us news of the latest results of research and the practical application of new production ideas. In articles we are able to read the views of experts to talk with whom many an industrialist would willingly journey the length of the country. They abstract the essential points from overseas journals and save industry an immense amount of time and trouble in so doing. They act as an exchange of information on welfare and other works management problems which are always of great importance, and are vital in our war production drive.

"The technical Press is fulfilling its functions despite difficulties. I only hope that those difficulties will not be aggravated. A technical journalist has to be doubly skilled. He has to be a good journalist to start with—and a responsible one. Accuracy in his facts and precision in his language are worthy things with him. But he has also to develop a far-reaching knowledge of the industry his journal serves. He has to be able to meet the experts on their own grounds. He has to draw out the good they can give their industry. He is the key man of his industry's brain exchange. It would be most unfortunate lightly to take away from the Services these experienced men, practically all of whom are serving hundreds, and in some cases thousands, of firms fully engaged on essential production.

"I hope, too, that something can be done about the paper problems of the technical Press. Few people in this country do not realize how important it is to us to have unfettered newspapers. Technical journals are the newspapers of industry—one might put it more vitally and say the newspapers of production. There is still too much paper used for publications which have a very poor claim to service to the community compared with those of the technical Press. There is no waste about the circulation of a technical journal. No one would buy a journal unless he were definitely interested in industry—and a particular industry at that. Further, each copy is nearly always read by more than one technician. Often a copy bought by a factory is read by a dozen executives, sometimes by many more. Taking our own case at the British Timken works, some journals are read by as many as 30 people. They are kept for more than a year, and are constantly referred to during that period. Moreover, these journals are read by leaders of industry overseas, many of whom are men of great influence in their respective countries. It is important that we should maintain that fine standard for which our technical journals have long been known and that we should present the picture of industry as it is—vigorous, efficient, and 100% engaged in the war effort. Every industrial concern ought to support to the full the technical journal representative of its sphere of activity."

National Gas and Electricity Committee

At the last meeting of the National Gas and Electricity Committee the Chairman, Mr. Robert Foot, reported that in view of his appointment as General Adviser on Wartime Organization to the B.B.C. he felt compelled, with very great regret, to resign his position as Chairman of the Committee. The Committee received this intimation with sincere regret and, although it was their unanimous desire that, if it were possible, Mr. Foot should continue to act as Chairman, it was agreed, after hearing Mr. Foot's personal statement, that there was no alternative but to accept his resignation. Mr. Foot has been Chairman of this Committee since its inception in 1939, and with one accord the members have expressed their great appreciation of the extremely valuable services rendered by him during this period. The Committee could not have been better served. They congratulated Mr. Foot on his important temporary appointment with the B.B.C., and wished him well.

Following Mr. Foot's resignation, Mr. John Mould, who has been acting as Vice-Chairman of the Committee since its formation, was unanimously elected Chairman. Mr. Mould is a representative of the I.M.E.A. on the Joint Committee and is Past-President of that Association. Mr. E. V. Evans was unanimously elected Vice-Chairman in place of Mr. Mould.

The Committee also received with great regret the resignation of Mr. E. J. Fottrell, one of the Joint Managers of the National Gas Council, who has been acting as one of the three Joint Honorary Secretaries since the formation of the Committee. Mr. Fottrell has recently been seconded by the National Gas Council for important work on the staff of the Director-General of Gas Supply at the Board of Trade and will therefore be no longer available. The Committee put on record their high appreciation of the work which Mr. Fottrell had done for the Committee and wished him every success in his new appointment.

CALORIFIC VALUE OF GAS*

YESTERDAY, TO-DAY, AND TO-MORROW

By J. JAMIESON, *Engineer and Manager, Edinburgh Gas Department*

SIR FREDERICK WEST, in a contribution to the excellent and progressive Symposium at the June Meeting of The Institution of Gas Engineers on the Standardization of the Declared Calorific Value of Gas, led me to make an examination of Statutory and non-Statutory gas undertakings in Scotland. My abstract has been compiled from the Board of Trade Return for 1938, and has been adjusted for known alterations in the Return since that date, and in the case of non-Statutory undertakings from the *Gas World Year Book* for 1941, see Statement No. 1.

The first point that impresses one on glancing at the statement is the fact that no fewer than 57 (16 Statutory and 41 non-Statutory) undertakings out of 205 have no set calorific value or have omitted to return one. True, this total number only accounts for little more than 1% of the total make of gas, but they include a number of undertakings which are by no means negligible in output.

Although not quite so numerous as in England, there are no fewer than 17 different declared calorific values ranging from 375 to 550 B.Th.U. per cu.ft., though most of the Scottish undertakings are carbonizing similar coals mainly of a weakly caking nature. Such a wide range of calorific values cannot be accounted for by differences in carbonizing plant, as the 62 undertakings with vertical retorts supply gas of 12 different values ranging from 375 to 500. Geographical location may account for some of the disparity, but viewed dispassionately there seems no reason for small differences in calorific value of 5 to 15 B.Th.U. between near neighbours.

STATEMENT NO. 1.—STATEMENT OF GAS SUPPLIED AT VARIOUS CALORIFIC VALUES IN SCOTLAND.

Calorific Value.	Statutory Undertakings. No.	Make Millions.	% Total Make.	Non-statutory Undertakings. No.	Make Millions.	% Total Make.	Total. No.	Make Millions.	% Total Make.
550	—	—	—	2	28	0.7	2	28.0	0.1
530	—	—	—	1	25	0.7	1	25.0	0.1
500	6	560.7	2.0	18	331.8	8.7	24	892.5	2.8
475	3	200.2	0.7	8	204	5.4	11	404.2	1.2
470	2	92.9	1.3	3	137	3.6	5	229.9	0.7
465	—	—	—	1	30	0.8	1	30.0	0.1
460	—	—	—	4	74	1.9	4	74.0	0.2
450	19	21476.8	75.1	25	555	14.6	42	22031.8	68.0
440	4	1116.8	3.9	2	71	1.9	6	1187.8	3.7
430	3	940.0	3.3	9	468	12.3	12	1408.0	4.3
425	6	1610.3	5.6	6	273	7.2	12	1883.3	5.8
420	3	258.9	.9	6	425	11.2	9	683.9	2.1
415	—	—	—	1	10	0.3	1	10.0	—
410	2	1211.4	4.2	2	227	6	4	1438.4	4.4
400	4	914.1	3.2	3	573	15.1	10	1487.1	4.6
375	1	91.8	0.3	1	23	0.6	2	114.8	0.4
350	—	—	—	2	51	1.3	2	51.0	1.2
No Declarations	16	132.8	0.5	41	290.7	7.7	57	423.5	1.3
	69	28606.7	100.0	136	3796.5	100.0	205	32403.2	100.0

Note.—Information for Statutory Undertakings extracted from B.O.T. Returns, 1938, Part I. Adjusted for known alterations: Aberdeen, Coatbridge, Edinburgh, Glasgow, and Paisley. Information for Non-Statutory Undertakings: Extracted from *Gas World Year Book*, 1941.

Sir Frederick West suggested that standardization at four values, 500, 475, 450, and 425 B.Th.U., should meet all requirements, and if the undertakings in Scotland are grouped accordingly at the nearest of these values the following table emerges:

Calorific Value.	Undertakings.	Output in Million Cu.ft.	Percentage of Total Make.
500	27	945.5	3.0
475	17	664.1	2.0
450	52	23293.6	71.9
425	34	3985.2	12.2
	130	28888.4	89.1
400	14	2925.5	9.0
Under 400	4	165.8	0.6
No declaration	57	423.5	1.3
	205	32403.2	100.0

No fewer than 130 of the 148 undertakings with a published calorific value fall into the four suggested groups covering almost 90% of the total make. The largest group is at 450 B.Th.U., where 52 undertakings making 72% of the total gas appear. This large percentage of total make is very much influenced by the outputs of the four cities who are all now supplying gas of this quality, but if they be deleted this would still leave 48 undertakings out of 114 supplying at this calorific value.

For Scottish undertakings using weakly caking coals I would suggest a range of values a stage lower than those put forward by the President of the Institution, particularly when benzole extraction is practised. Incidentally, where benzole is fully recovered, Scottish undertakings with the low sulphur content in the coal have now found a solution to the sulphur problem and the gas produced contains only 4 to 8 grains of sulphur per 100 cu.ft. Surely such a contribution to the efficient use of gas in flueless heaters and its effect on other apparatus will mean the continued use of these benzole plants as part of the permanent gas purification process. Indeed, I go so far as to suggest that no gas-works is properly equipped unless it has a benzole recovery plant and a carburetted water gas plant in addition to the carbonization plant, in order that the changes can be rung and full advantage taken of the variations in the residual products market.

To return to my point, I would therefore suggest that two calorific values only are required in Scotland—400 and 450 B.Th.U.—and it would be a fine, indeed a leading, gesture of Scottish unity and nationalism if one standard value—say, 425 B.Th.U.—could be adopted. For the majority of undertakings the time is opportune for taking the preliminary steps, and while some may say it is premature to fix a standard value for Scotland and may suggest awaiting the report of the Institution Committee, there seems to be no reason why a preliminary levelling up or down should not be carried out now when the opportunity presents itself, particularly in those undertakings where no declared value has yet been established.

Yesterday

In my Presidential Address to the Junior Gas Association (Western District) in 1920 I said: "From actual experience I am strongly of opinion that gas of low grade quality is highly beneficial, and whether 450 or 400 B.Th.U. gas is supplied matters little, provided its composition is constant and the pressure arrangements adequate. The gas-consuming public are quickly accustoming themselves to the changed and changing conditions; and where gas engineers have taken time by the forelock, and adjusted all the gas-burning appliances in the district, complaints are now fewer than in pre-war days. This I am pleased to say has been accomplished in Greenock, and we are ready at any moment to supply gas of 400 B.Th.U. quality or lower, as circumstances demand. Gas of this quality has been distributed in Greenock with excellent results, and with no increase in the normal complaint list."

Two years later I find myself skating on much thinner ice, and in a contribution to the discussion on "Gas Quality," opened by the late Mr. Keillor, of Greenock, and Mr. Richmond, of Penicuik, I said:

"I served under Mr. Keillor, and had the opportunity of manufacturing and distributing 400 B.Th.U. gas. My position in that respect is probably unique, as to-day I am connected with an undertaking which is notorious for high quality gas. After an experience of fully twelve months with this high quality gas I am more convinced than ever that quality of gas matters little, provided the composition is constant and the pressure arrangements adequate. . . . A 500 B.Th.U. gas in my opinion, when consumed in ordinary domestic appliances, is as efficient as 400 B.Th.U. . . . After my experience with both high and low quailty gas, if I were asked what quality would be the more economical for Edinburgh I would say 500 B.Th.U. If I were asked to make a declaration for Greenock, I would say 400 B.Th.U. . . . The question which now concerns us is: 'Can a one-stage process, carbonizing ordinary Scotch coal, produce gas of 500 B.Th.U. quality constant enough to comply with the Gas Regulation Act; and, if so, can that quality be produced in verticals economically in comparison with the two-stage process?' I am far from convinced that such is the case, and that is after a long experience with the carbonization of Scotch coal in vertical retorts. I think machine-charged horizontal retorts where suitable coals are available coupled with water gas is the most economical process if a high production of therms is the objective, and at least 120 therms of 400 B.Th.U. gas is possible per ton of coal carbonized. Storage accommodation in Edinburgh being limited, a reduction in quality would mean increased capital costs for additional storage, which means an increase in the cost per therm. Gas in Edinburgh has to be supplied under pressure from the works to distribution stations, and if we can supply a therm by handling 200 cu.ft. instead of 250 cu.ft. the cost is less for the higher quality.

"While these are small items in the total cost the cumulative effect of them has an important bearing on the final cost of the gas. Recently we made some tests on the efficiency of different qualities of gas between 500 and 300 B.Th.U., and I can confirm that in all cases we found that one B.Th.U. is as good as another irrespective of quality. There is, therefore, no advantage to the consumer in supplying low quality gas unless it can be produced and supplied cheaper than high quality gas. An important factor, and one which Mr. Keillor does not emphasize in the least, is the time taken to do a specified amount of work, and on this score high quality gas is the more efficient.

"I am prepared to say that the repairs to meters cost less per therm in Greenock than in most undertakings in this country. Low grade gas, if manufactured properly, is not more detrimental to distribution plant than high grade gas; and it is certainly much less destructive than a 500 B.Th.U. coal gas from horizontal retorts, which can only be produced by dilution with producer gas, waste gases, or air."

Since I had satisfied myself that there is no economic advantage in supplying the consumer of gas with gas lower than 500 B.Th.U. unless it can be produced at a cheaper price, I put in hand a comprehensive investigation and examination of the production costs of different

* From an Address at a Joint Meeting of the Scottish Junior Gas Association, Dec. 6, 1941.

grades of gas. The results of that investigation were given in a Paper to the North British Association of Gas Managers in September, 1932.

Coal was taken as 17s. 5d. per ton, coke 18s., breeze 7s. 6d., tar 2d. per gallon, sulphate of ammonia *nil*, steam 1s. 6d. per 1000 lb.

From the tests I concluded that a change in the price of coke and breeze will affect the cost of gas produced at the higher quality much more than the gas at lower calorific values, and in the case of tar, *vice versa*. At 450 B.Th.U., however, the revenue from each source is practically the same, and any alteration in the price of one or other residual will not have the same disturbing effect on the production cost of gas. I went on to say:

"The net production cost on the basis of dry coke shows some interesting figures, the lowest being 1.19d. at 450 B.Th.U., followed by 1.24d. at 425 B.Th.U., 1.29d. at 475 B.Th.U., 1.31d. at 400 B.Th.U., and 1.54d. for the highest value 500 B.Th.U."

With the prices ruling when this statement was prepared one can conclude that with average Scotch coal when carbonized in continuous vertical retorts the most economical quality of gas to produce is in the region of 450 B.Th.U., and that opinion is strongly supported by the number of undertakings supplying it. A change in the price of coal, a drop in the value of coke or tar, may alter the position, but from whatever angle I have approached the subject I have been impressed with the consistency of the results and costs following the middle range of quality—so much so that I consider it would make not only an efficient but an ideal standard declaration for Scotland, whether gas is produced in continuous vertical retorts or by the two-stage process.

In 1938, in a contribution to the discussion on a Paper presented by Mr. J. Blundell at a meeting of the North British Association of Gas Managers, I said, referring to the foregoing:

"While I convinced myself, I did not convince many of my colleagues, as the only changes which have taken place since are: Edinburgh, 500 to 475 B.Th.U.; Paisley, 500 to 450 B.Th.U.; Coatbridge, 475 to 500 B.Th.U.; and Motherwell, 400 to 425 B.Th.U. These changes, it will be noted, are all within the groups suggested by me but show no consistency in their application. That is indicative of the general feeling in Scotland, if not throughout the Industry, towards this important subject. Mr. Blundell put forward five declarations to meet the requirements of the whole country and he evidently favours, for reasons which he does not disclose, a quality for Scotland of 425 to 400 B.Th.U. I would also like to know why the Author favours 500 B.Th.U. for London in comparison with, for instance, 425 B.Th.U. for Edinburgh. The average price per therm of coal less coke for the last three years for the Gas Light & Coke Company was 1.65d., for the South Metropolitan Gas Company 1.55d., and for Edinburgh 1.28d. I would have thought that the net cost of coal or the coal coke ratio as he decribes it would have applied in determining the calorific value as forcibly in London as in the provinces. Again, if we take Mr. Blundell's groups and also take as an example an undertaking in Scotland supplying each of the qualities he mentions, the difficulty in justifying his allocation becomes more apparent.

"These may be individual cases, but they are the average of three years and on that account are fairly representative. The lowest price per therm is returned at 450 B.Th.U., followed by 475 B.Th.U.

"Analysis of Accounts—Average of Past Three Years.

Declared Calorific Value.	Coal less Coke price per Therm.
500	1.40d.
475	1.28d.
450	1.21d.
425	1.73d.
410	1.77d.
400	2.02d.

"In 1932 I gave the results and costs of producing gas at these different qualities, and an interesting comparison emerges if we compare those figures with the costs quoted for the individual undertakings:

"Declared Calorific Value.	Coal less Coke Price per Therm.	Edinburgh Test Results.
500	1.40d.	1.41d.
475	1.28d.	1.30d.
450	1.21d.	1.10d.
425	1.73d.	0.92d.
410	1.77d.	0.86d.

"At and above 450 B.Th.U. the costs are very closely related, but below 450 the Edinburgh costs are much lower and more in keeping with what one expects from the production of low quality gas. The Edinburgh results were obtained under actual working conditions and were in no sense experimental. The make of gas per ton of coal carbonized increased in each test with remarkable regularity, 41.5 therms or 50% more therms being produced at 400 than at 500 B.Th.U.

"I am doubtful if any progress will be made in the standardization of calorific value until the production and sale of coke are co-ordinated and strictly regulated throughout the whole country. That, in my opinion, is a more pressing question at the moment than any other problem before us.

"In an unrestricted market the price of coke to-day would not be more than 20s. Indeed, it is doubtful if the market would absorb production at a price even substantially below that figure. With the increased quantities of furnace coke now available the future outlook is by no means bright, and I personally can see no alternative but a reduction of the calorific value of the gas or the development of the domestic market for coke in competition with coal. We have meanwhile adopted the latter policy by offering coke fires on hire purchase. When we reduced the quality of gas from 500 to 475 B.Th.U. we reduced the quantity of coke for disposal by 12,000 tons per annum, and we estimate if we now declare 450 B.ThU., the coal consumption will fall by 21,000 tons and the amount of coke produced by 13,000 tons. To place anything like that quantity of coke on the domestic market, no matter how forceful our selling policy may be, would, from my past experience, take years. It looks, therefore, as if we will have to adopt both proposals unless the position alters materially in the immediate future.

"I agree with Mr. Blundell that under normal conditions the capacity of the distribution system should not be allowed to have undue weight on a decision of this kind. In Edinburgh, however, with a statutory area of 116 sq. miles, the gas being supplied from one works under pressure, distribution assumes considerable significance. With coal and coke at present prices, we would save only £800 per annum in changing from 475 to 450 B.Th.U. That sum would not meet the extra distribution costs involved. Over the last twenty years our average price of coke had not been less than the purchase price per ton of coal, and, bad as the market looks, I do not think it will do so in the future. With coal and coke at 22s., the production of 450 B.Th.U. gas in our case would show a saving of £5,600 per annum, so that if the assumption made by Mr. Blundell that the price of coke will be stabilized at or about the same price of coal proves correct, it looks as if a change in our declared calorific value could not be much longer delayed."

To-day and To-morrow

To-day only 3% of the gas supplied in Scotland has a declared calorific value of more than 450 B.Th.U. Within the past twelve months many important changes have been made, such as Coatbridge, 500 B.Th.U. to 450 B.Th.U.; Aberdeen and Edinburgh, 475 B.Th.U. to 450 B.Th.U.; Glasgow, 470 B.Th.U. to 450 B.Th.U.; Paisley, 450 B.Th.U. to 425 B.Th.U.; and Helensburgh, 440 B.Th.U. to 400 B.Th.U. There may have been other changes or there may be changes in contemplation, but I do suggest that there is sufficient evidence available now to support the argument I put forward in 1932 that 450 B.Th.U. is a suitable and economic standard quality of gas for Scotland.

How far these changes have been dictated by the difficult coal position, by the introduction of benzole recovery or by other difficulties arising out of the war I am not in a position to say. How far these changes will survive the post-war years, time alone will tell, but so far as Edinburgh is concerned I shall be surprised if 450 B.Th.U., or indeed 425 B.Th.U., will not be permanently established. That bogy, the capacity of the distributing mains to deal with the increased quantity of gas required as a result of a reduction in the calorific value, is about or has been exploded. The four cities have reduced the calorific value of gas from 500 to 450 B.Th.U. without any serious difficulty or expenditure on trunk mains. Is the distributing system in these cities sufficiently flexible to meet these important and revolutionary changes without disturbance or inconvenience to the consumer, and have our fears in that respect been more imaginary than real?

Does the Gas Industry need and does it want a universal standard calorific value of gas? If not, will 400 B.Th.U. gas be the ultimate standard for Scotland? To these questions I to-day invite your answer.

NEW PATENT

Cooker Hotplate Burners

A patent (No. 540,384; application date, April 12, 1940) granted to the Gas Light & Coke Company, L. T. Minchin, D. Harrison, and E. W. B. Dunning concerns improvements in aerated gas burners and has for an object to improve the efficiency of such burners when used with hotplates.

The patentees remark that it is known that if, with a given burner, the size of the injector orifice is decreased (thereby reducing the gas rate at constant pressure), the aeration is correspondingly increased. It might, therefore, appear that the decrease in the size of the injector orifice is an appropriate way of increasing the aeration of a burner up to any desired amount, but there is a limiting velocity of efflux of the mixture beyond which the flame is no longer stable and lighting back to the injector is likely to take place. The conditions which determine the stability of the flame include *inter alia* the condition that the velocity of efflux must be well in excess of the flame velocity in the mixture. The reduction in the size of the injector orifice results both in the reduction of the velocity of the efflux and also in an increase in the aeration which in its turn increases the flame velocity at the burner head. In practice, it has been found heretofore that the practical limit of aeration is about 3 parts of air to 1 of gas for a gas having a C.V. value of 500, whereas the aeration required for complete combustion is well above that value—*e.g.*, should amount to 4¼ of air to 1 of gas.

There is provided a combination with a gas burner having an injection nozzle designed to provide a fully aerated mixture and a non-return flame trap at or near the mouth of the burner head of a hotplate disposed "close" to the mouth of the head. By "close" is meant a distance shorter than is possible with an ordinary burner without smothering due to the flow of secondary air to the flame being restricted by the proximity of the hotplate. Disposition of the hotplate near the burner head improves the thermal efficiency of the apparatus.

The hotplate may be carried by a casing within which the burner is mounted, which casing may be closed except for a flue outlet and an air inlet. The underside of the hotplate may be provided with a

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2—Have you installed labour-saving equipment to speed up loading and unloading? If this is not possible have you improvised?

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5—Have you talked the matter over with the men who actually load and unload?

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Issued by the Ministry of War Transport

number of projections which are preferably arranged in a concentric series, the spacing apart of the inner series being greater than the outer series.

The burner may be encircled by a reflector—for example, in the form of a bowl—whereby any stray radiant heat is directed on to the under surface of the hotplate. The flame trap may comprise a sheet of perforated metal or other heat-resisting material extending across the whole of the mouth of the burner head. By these means the injector may be designed to give an aerated gas mixture of 7 : 1 which is sufficient and more than sufficient to effect complete combustion.

The perforations are preferably circular in form and the radius thereof is given by the expression $\frac{1}{r} - \frac{2r}{b^2}$ equals or is greater than 45, where r is a radius of the perforations and b is the distance apart between the centres of the perforations both measured in inches. The perforations could equally well be in the form of slots or could have shapes other than circular provided they are small enough and far enough apart not to permit a flame to pass through them.

By preventing lighting back by the use of a flame trap there may be employed a burner having a much lower resistance to the flow of gases than is otherwise possible, which lower resistance enables higher aeration to be obtained.

Fig. 1 is a perspective sectional view through the upper part of a gas cooker showing a form of burner for heating the hotplate.

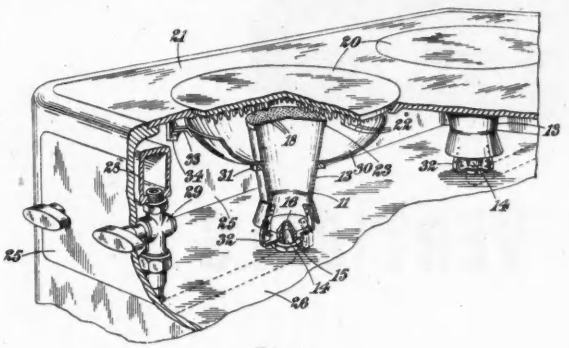

FIG. 1.

The gas stream is directed into a passage having a throat 11, which passage diverges as it extends away from the throat towards the burner head 13. For a fully aerated burner according to this invention, the area of the throat may be 0.03 sq.in. per cu.ft. of gas per hour.

The injector nozzle 14 may be provided with a tapering bore 15 which at its smaller end meets the injector orifice 16, the cone angle of which tapering bore is about 65°. The external surface of the injector may also be conical and may have a cone angle of about 90°.

The aforesaid throat may comprise a cylindrical portion and the walls of the diverging portion of the passage are inclined to the axis of the passage at an angle of about 3°. The length of the cylindrical portion of the throat (in the case of the burner consuming 15 cu.ft. per hour) is about 2 in. A perforated metal plate 18 is arranged at the extreme outlet end of the burner head.

The perforated plate may be formed from the alloy sold under the registered trade mark "Tungum." This material is chosen because it is sufficiently soft to be punched and at the same time is reasonably resistant to corrosion, but other materials may be employed having the characteristics that they are resistant to corrosion and can be punched. The plate may be punched with 0.029 in. diameter holes spaced 0.051 in. apart between centres. With this form of punching 23% of the surface of the plate is represented by openings.

The upwardly directed burner head 13 is joined by a bend with the mixing chamber. It is found that the bend is a somewhat critical factor with regard to a resistance of flow of the gases and thus the degree of aeration. The bend should be smooth and have as large a radius of curvature as possible.

Although very high degrees of aeration can be obtained by the use of the above features, it has been found that a maximum aeration does not give the highest thermal efficiency, but it has been found that an air gas ratio of about 7 : 1 keeps the burner head cool and so reduces considerably the corrosion and distortion of the head in use. The burner flame remains perfectly stable when turned down to a consumption of 1 or 2 cu.ft. per hour, and thus is eminently suitable for cookers where simmering or stewing facilities are required.

There is provided in combination the aerated gas burner as described above and an imperforate hotplate 20 disposed above the burner. The hotplate may be arranged flush with a cover beneath which the products of combustion are confined, and a flue (not shown) is associated with the cover to conduct away said products. There is thus provided a solid top which is usually associated only with electric cookers or with gas hotplates on heavy duty restaurant cookers. It will be appreciated that when an imperforate hotplate is employed it is desirable that the burner should be fully aerated and not depend on the supply of secondary air to the mixture outside the burner.

The introduction of a hotplate between the flame and the cooking utensil introduces three sources of loss of heat—(*a*) between the flame and hotplate, (*b*) the heat capacity of the plate itself—*i.e.*, heat which should be passed into the cooking utensil is retained in the plate—and (*c*) between the plate and the pot. The loss due to (*a*) may be minimized by providing a suitable under-surface for the hotplate for scrubbing the maximum heat from the plate.

In the construction shown in the drawing the under-side of the hotplate is provided with a number of projections 22. The most suitable form of projections is provided by a multiplicity of pegs distributed over the under-surface, although heat losses may also be reduced by the provision of ribs or fins on the underside of the plate in place of or in addition to the pegs.

The circular hotplate is provided with seven concentrically arranged rows of pegs disposed apart by about $\frac{1}{4}$ in. with the outermost row near the circumference of the plate and having 62 equally spaced pegs, whereas the succeeding rows have 38, 32, 26, 20, 12, and 9 equally-spaced pegs respectively. The pegs may be $\frac{1}{2}$ in. long, $\frac{3}{16}$ in. in diameter at their bases, and $\frac{1}{4}$ in. in diameter at their tips.

Various forms of radially-extending ribs and interrupted circumferentially extending ribs are also suitable. The rate of transfer of heat may also be assisted by providing the under-face of the plate with circumferential channels.

In order to compensate for the loss of heat referred to under the heading (*b*) above, it is desirable to make the plate of minimum thermal capacity and of maximum thermal conductivity. For example, in the case of a burner consuming about 30 cu.ft. of gas per hour, the hotplate may be formed from cast-iron and may be about 7 in. in diameter and about $\frac{3}{16}$ in. thick.

Since secondary air is not required for a fully aerated burner, the burner can be placed nearer the underside of the hotplate and thus a higher heat transference and neater design can be obtained. The minimum distance apart of the burner from the plate is about $\frac{3}{4}$ in. for a gas consumption of 30 cu.ft. per hour.

The diameter of the burner head should be as small as possible, and it may be possible to diminish the size by employment of slits instead of circular holes as referred to above.

In order to improve the flameproofness while keeping the flame of the burner head small, the actual area of perforated metal can be increased by arranging the metal in the form of an inverted cone or in the form of ridges.

In the arrangement shown the mixing chamber for the air and gas is associated directly with the burner head 13. The head is made in the shape of an upright venturi tube having the throat 11 nearer the lower end into which the injector nozzle 14 is directed. This form of burner head may be conveniently formed from sheet metal. The perforated metal plate 18 is secured to the top of the burner head by flanging over its edge at 23. It will also be noted that the burner is located within an enclosed space bounded at the top by the hotplate 20 and cover 21 and by side and bottom walls 25 and 26. The supply pipe 27 for the injector nozzle extends beneath the bottom wall 26 upwardly through a hole in that wall and is connected to the gas rail 28 through a control cock 29.

The burner head is surrounded by a bowl 30 provided with an internal reflecting surface which is arranged to direct any stray radiant heat in to the under-surface of the hotplate 20. In order to prevent resonance troubles occurring the bowl may be provided with a number of apertures.

In addition to reflecting radiant heat, the provision of the bowl prevents stray air currents mixing with the hot gases and diluting and cooling them thereby lowering the efficiency. The number of apertures in the bowl allows some air to pass through which does cool the products, but this is controlled. The burner head may be provided with lugs 31 for supporting the bowl and is located at the lower end on the injector nozzle by a suitable spider member 32. The bowl is provided at its upper edge with lugs or arms 33 which engage sockets 34 formed on the inner side of the cover 21. It will be appreciated, however, that there may be other methods of supporting the burner.

Co-Partnership in Wartime

Figures presented at the annual general meeting of East Surrey Gas Company Co-Partners, held on Nov. 22, revealed that in spite of wartime conditions the financial position has been maintained. Presiding at the meeting, Mr. W. Lees Stenning (Chairman of the Company) was supported by Messrs. W. H. Bennett (Vice-Chairman), R. H. Mew (Director), J. R. W. Alexander (General Manager), Horace Long (Secretary to the Committee), Ernest Scears (Chief Engineer), Arthur Tennant (Sales Manager), and a large number of co-partners.

Bonus and interest payable to the co-partners during the past year reached the figure of £2,202, while savings amounted to £402, and the sum of £1,774 was added by the co-partners to their investments in the capital stock of the Company. Since co-partnership was established in the Company, the total bonus and interest received by members had amounted to £38,242, and the sum now standing to their credit in the capital stock and various co-partnership funds amounted to £26,946.

The Chairman expressed the Directors' appreciation of the successful accomplishment by them all of another year's work in the service of the community, and said it was particularly pleasing to record that their consumers continued to express their thanks for the willing and loyal co-operation of those engaged in the service of the Company. Continuing, he said this was a somewhat sad occasion in that Mr. Long occupied the position of Co-Partnership Secretary and Trustee for the last time at a general meeting, as he would retire as Secretary and Accountant of the Company at the end of February next. Mr. Long assumed his Co-Partnership offices when the scheme was instituted 28 years ago. Those who had been most closely associated with him had learnt to appreciate his whole-hearted devotion to the principles of co-partnership and to the progress of their own scheme.

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Gas Products Prices

The London Market

Dec. 15.

Current prices of Coal Tar Products in the London market are about as under:

Pitch nominal; creosote 5d. to 5¼d.; refined tar 4d. to 4¼d.; pure toluene under the Ministry of Supply Toluene No. 2 Order 2s. 5d.; pure benzole 1s. 10d.; 95/160 solvent naphtha 2s. 5d. to 2s. 8d.; and 90/160 pyridine 13s. 6d.; all per gallon naked *ex* Makers' Works. By the Direction issued under the Control of Coal Tar Order, 1941, maximum prices have been fixed for all grades of Naphthalene. The maximum price for refined crystal naphthalene in 2-cwt. bags and in 4-ton lots is £23 per ton delivered.

The Provinces

Dec. 15.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 1s. 10d. (controlled by the Control of Toluene No. 2 Order, July 5, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North, 11d. to 1s. Solvent naphtha, naked, North, 1s. 9d. to 1s. 10d. Heavy naphtha, North, 1s. 9d. to 1s. 10d. Creosote, *ex* works, in bulk, North, liquid and salty, 4½d. to 4¾d.; Scotland, 4½d. to 4¾d.; low gravity, 4½d. to 4¾d. Fuel Grade, 4d. to 4¼d. Carbolic acid, 60's, 3s. 7½d. to 3s. 9d. Naphthalene, £15 to £20. Salts, drained, £6 to £6 10s.; whizzed 72°, £7 15s.; 78°, £9 5s. Anthracene prices fixed by Controller. Heavy oil: Unfiltered anthracene oil (min. gr. 1,080), 6d. to 6½d.; filtered heavy oil (min. gr. 1,080), 6½d. to 7d.; heavy anthracene oil gr. less than 1,080, 5¾d. to 6d.

*In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10.

An Interim Dividend of 3½% (less income tax), payable on Jan. 16, has been declared on the First Preference Stock of the Malta and Mediterranean Gas Co., Ltd.

Tar Products in Scotland

GLASGOW, Dec. 13.

More activity is noticeable in this area and prices continue strong.

Refined tar is still in good call at 4¾d. to 5d. per gallon in home markets and about 4¼d. to 4½d. per gallon for export, both f.o.r. naked.

Creosote oil: Production is readily disposed of at the following prices: Specification oil, 5¾d. to 6d. per gallon; low gravity, 6½d. to 7d. per gallon; neutral oil, 6d. to 6½d. per gallon; all *ex* Works in bulk.

Cresylic acid remains difficult with values nominal. Pale, 99/100%, 4s. 9d. to 5s. 3d. per gallon; Pale, 97/99%, 4s. 3d. to 4s. 9d. per gallon; Dark, 97/99%, 4s. to 4s. 3d. per gallon; all *ex* Works in buyers' packages.

Crude naphtha shows no alteration at 6½d. to 7½d. per gallon *ex* Works in bulk, according to quality.

Solvent naphtha: 90/160 grade is firmer at about 2s. per gallon and 90/190 Heavy Naphtha is 1s. 6d. to 1s. 9d. per gallon.

Pyridines are quiet with 90/160 grade about 14s. per gallon and 90/140 grade about 16s. per gallon.

The Newcastle-on-Tyne and Gateshead Gas Company has announced that the calorific value of gas will be reduced from 500 to 475 B.Th.U. after Jan. 1. No change, however, will be made in the Morpeth area.

The Executive Committee of the Gas Companies' Protection Association will meet at the offices of the Association at 2.30 p.m. on Dec. 22.

Gas Stocks and Shares

Another quiet week was spent in the stock markets, the turnover being even less than during the previous few weeks, when the volume of business had been exceptionally small. There was a little more doing in the gilt-edged market towards the close although the few price changes in this section were mostly fractionally lower—2½% Consols finished a point down at 81½. Home rail ordinary and preference stocks received support on dividend prospects. Industrials continued irregular and price movements unimportant. The better news from Russia led to a demand for certain oil shares, but the mining market was featureless.

The volume of business in the Gas Market was also on a smaller scale last week though with few exceptions prices remained unchanged and there were no special features. A glance through the recorded transactions indicates that the majority of these were done at top prices. The only reaction occurred in Gas Light units, which fell 9d. to 13s. On the other hand, in the Supplementary List Brighton 5% debenture stock gained 5 points to 95½.

The following quotations were altered or marked *ex div.* during the week:

OFFICIAL LIST

Commercial 3 p.c. Deb. (*x.d.*) ...	55—60	Dec. 8
Gas Light Units	12/6—13/6	—/9
Ditto 5 p.c. Red. Deb.	103—106	+1
Tottenham 4 p.c. Deb. (*x.d.*)	82—87	Dec. 8
Watford 3½ p.c. Red. Deb. (*x.d.*) ...	84—89	"

SUPPLEMENTARY LIST

Brighton 5 p.c. Deb.	93—98	+5
Uxbridge 5 p.c. Deb. (*x.d.*)	97—102	Dec. 8

PROVINCIAL EXCHANGES

Liverpool Ord....	97½—99½	— ½
Newcastle Units	18/6—19/-	+—/3
Sunderland max.	111—113	+3½

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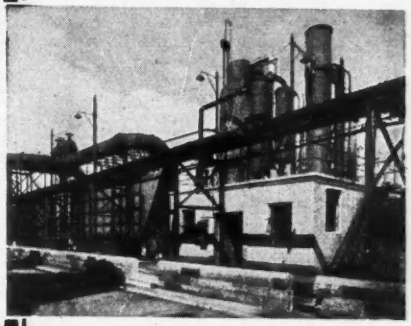
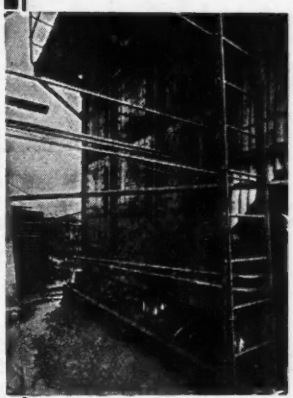


"Permac" Joints in a Gas Works.



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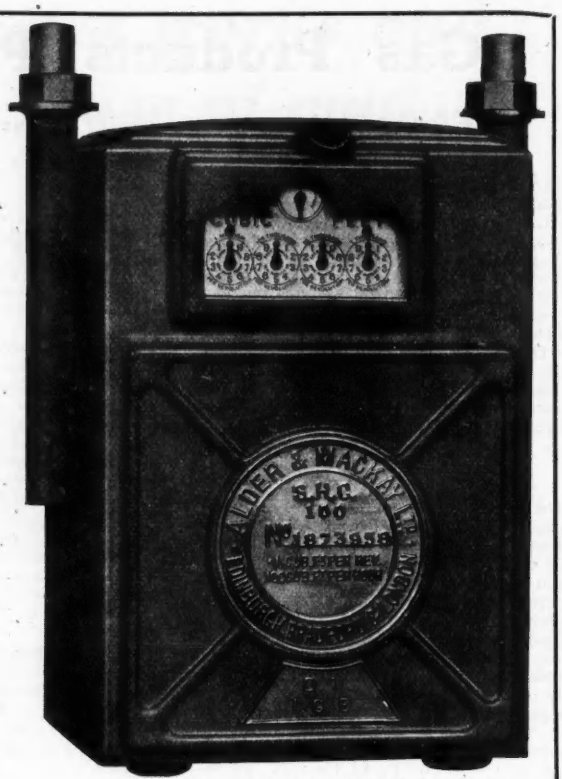
Number Thirty-eight.



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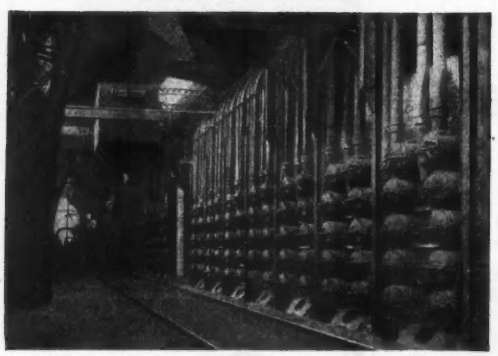

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